

IN THE CLAIMS:

Amend claims 1, 3, 5-8 and 37, cancel claim 2 without prejudice or admission, and add new claim 38 as shown in the following listing of claims, which replaces all previous versions and listing of claims in this application.

1. (currently amended) A method of cross-sectional processing and observation comprising:

a first step of processing at least one predetermined area in a surface of a sample to form a target cross-section by etching the at least one predetermined area with a focused energy beam using a focused energy beam irradiating unit in a vacuum chamber; and

a second step of observing the target cross-section by scanning the target cross-section with a probe of a scanning probe microscope in the vacuum chamber and detecting a physical quantity produced between the probe and the target cross-section.

2. (canceled).

3. (currently amended) The method of cross-sectional processing and observation of claim 2, ~~wherein~~ 1; wherein the focused energy beam is a focused ion beam.

4. (previously presented) The method of cross-sectional processing and observation of claim 3; wherein the first step includes a step of decomposing an organic metal gas with the focused ion beam in a predetermined location of the sample to make an electrode and an interconnect after carrying out the etching process with the focused ion beam.

5. (currently amended) ~~The~~ A method of cross-sectional processing and observation, comprising: ~~providing of claim 1; wherein the first and second steps are carried out using a system for cross-sectional processing and observation, the system having~~ observation comprised of a processing unit for processing the a surface of the a sample to expose a target cross-section thereof, and and a scanning probe microscope unit for observing the target cross-section both disposed in a single vacuum chamber; processing at least one predetermined area in the surface of the sample using the processing unit to expose a target cross-section thereof; and observing the exposed target cross-section by scanning the exposed target cross-section with a probe of the scanning probe microscope unit.

6. (currently amended) A The method of cross-sectional processing and observation according to claim 5, further comprising: removing a damaged portion remaining in

the exposed target cross-section and then forming a stepped portion according to a difference in materials among layers forming the exposed target cross-section.

~~a first step of processing at least one predetermined area in a surface of a sample to expose a target cross-section;~~

~~a second step of removing a damaged portion remaining in the exposed cross-section and then forming a stepped portion according to a difference in materials among layers forming the exposed cross-section; and~~

~~a third step of observing the exposed cross-section with a scanning probe microscope.~~

7. (currently amended) The method of cross-sectional processing and observation of claim 6; further comprising a step of finishing the exposed target cross-section into a mirror face before the stepped portion is formed.

8. (currently amended) The method of cross-sectional processing and observation of claim 2; ~~wherein~~ 1; wherein the first step and the second step are repeated sequentially.

9. - 30. (canceled).

31. (previously presented) The method of cross-sectional processing and observation of claim 1; wherein the physical quantity is a physical quantity relating to an electric and magnetic solid state property of the sample selected from the group consisting of an electrical conductivity, a dopant concentration, a dielectric constant, a potential, a leaking magnetic field, and a spin interaction of the sample.

32. (previously presented) The method of cross-sectional processing and observation of claim 1; wherein the physical quantity is a physical quantity relating to a mechanical solid state property of the sample selected from the group consisting of a hardness, a friction, and an elasticoviscosity of the sample.

33. (previously presented) The method of cross-sectional processing and observation of claim 1; further comprising the step of observing a position of the probe using a microscope unit and controlling the position of the probe in accordance with observed information obtained from the microscope unit.

34. (previously presented) The method of cross-sectional processing and observation of claim 33; wherein the microscope unit comprises an optical microscope.

35. (previously presented) The method of cross-sectional processing and observation of claim 33; wherein the microscope unit comprises a scanning electron microscope.

36. (canceled).

37. (currently amended) The method of cross-sectional processing and observation of claim 7; wherein the step of finishing the exposed target cross-section into a mirror face is conducted by irradiating an electron beam in parallel with blowing of etching gas.

38. (new) The method of cross-sectional processing and observation of claim 6; wherein the removal of the damaged portion remaining in the exposed target cross-section and the formation of the stepped portion according to a difference in materials among layers forming the exposed target cross-section are conducted by irradiating an argon beam.